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Is India Ready for Inflation Targeting?[1]

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Abstract

In this paper we analyze whether the current macroeconomic environment in India is suitable for implementation of inflation targeting as a monetary policy strategy, in light of the recommendation of the Urjit Patel Committee Report. Our results indicate that historically the Reserve Bank of India has given more importance to inflation compared to output growth and exchange rate changes in its monetary policy conduct and that in recent times there has been an increased emphasis on monetary independence thereby comfortably placing the RBI on a path to move towards inflation targeting. However we also find factors, that are traditionally outside the control of monetary policy, do exert a strong impact on aggregate prices in India thereby making the choice of nominal anchor a tricky one. Furthermore, the success of monetary policy in containing inflation is found to be crucially contingent on an appropriate fiscal policy as well.

JEL Classification: E43; E52; E58

Keywords: Reserve Bank of India, Monetary Policy, Taylor Rule, Financial trilemma, Inflation, Nominal anchor, Fiscal deficit

[1] The views expressed in this paper are those of the author/s and do not necessarily reflect the views and policies of the Asian Development Bank (ADB) or its Board of Governors or the governments they represent.

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1. Introduction

In January 2014, the Expert Committee to Revise and Strengthen Monetary Policy Framework under the chairmanship of Dr. Urjit Patel (henceforth Urjit Patel Committee Report (UPCR)) made several important recommendations related to the conduct of monetary policy in India. These include (a) Using the Consumer Price Index (CPI) inflation as the nominal anchor for monetary policy communication; (b) moving towards an inflation targeting regime over the next two years with a target of 4% within a band of ±2%; and (c) setting up a five member Monetary Policy Committee, which will be responsible for making policy decisions, and be held accountable in case of failure to meet the nominal target.

In India, there has been a long-standing debate on the benefits and costs involved with a move towards inflation targeting. HPEC (2007), also known as Percy Mistry Committee Report, strongly advocated a move towards inflation-targeting pointing out associated benefits including fiscal stability and low output volatility. It also argued that an institutional commitment to predictable and low inflation would reduce risks from capital flight as value of the Rupee would be maintained in real terms and expectations about its future values would be stable. While it advocated the use of Consumer Price Index (CPI) inflation as the nominal target, it pointed out the necessity to cease subsidization of key prices and intervention in the commodity markets through price measures. Similarly, Planning Commission (2011) argued for reorientation of monetary policy towards price stability or low and stable inflation, although the report does highlight the deflationary cost associated with bringing down inflation from high levels and to build credibility for a central bank that has lacked inflation fighting credentials. Shah (2014) argues that every currency needs a nominal anchor as otherwise a country might end up printing too much 'fiat money', and that a foreign currency and CPI basket are the possible choices for nominal anchor. Of these, pegging to a foreign currency results in loss of monetary independence, and can lead to costly crises as witnessed in East Asia in 1997. In contrast, targeting inflation provides a durable long-term solution.

In sharp contrast, Subbarao (2009) points out that *"… inflation-targeting is neither desirable nor practical in India for a number of reasons."* These include (a) the need of a central bank of a developing country being guided by price stability, financial stability and growth; (b) food items continue to be vulnerable to supply shocks, especially because of vagaries of monsoon, and are beyond the ambit of monetary policy; (c) inefficient transmission mechanism due to large fiscal deficits, presence of administered prices and interest rates and illiquid private bond market; and (d) managing volatility of exchange rate in the face of disorderly capital flows.

In the aftermath of the UPCR, a number of articles have questioned the desirability and efficacy of inflation targeting in India. Nachane (2014) argues that inflation targeting regime, with an overwhelming desire to manage inflation, could have an adverse effect on a number of macro financial variables including exchange rate management, fiscal policy and financial stability.

The rest of the paper is structured as follows. Section 2 describes the main recommendations of the Urjit Patel Committee Report. In Section 3 we evaluate whether India is indeed amenable to the implementation of an inflation targeting (IT) regime by estimating a Taylor Rule for India. Section 4 highlights some of the key issues that policymakers will have to deal with if India moves on the path of inflation targeting regime. Finally Section 5 concludes with a summary of the main messages of the paper.

2. Key Highlights of the UPCR

The UPCR argues for the adoption of an inflation targeting regime, under which the objective is to achieve the inflation target on average over the business cycle. The report points out that by predominantly focusing on price stability, an inflation targeting regime anchors inflation expectations, improves overall macroeconomic stability, and enhances growth prospects in the medium run. At the same time, an inflation targeting regime allows the inflation to deviate from the target in the short run to accommodate growth concerns.

The UPCR favours domestic inflation as the nominal anchor over other historically used measures such as the exchange rate and monetary aggregates. While using the former as the nominal anchor involves relinquishing monetary policy independence and makes the monetary policy framework susceptible to speculative attacks and currency crisis, the use of latter can be undermined by instability and loss of predictability of the demand for money, thereby discrediting accountability and communication when targets are missed.

In contrast, using domestic inflation as the nominal anchor makes price stability the unambiguous and sustainable objective upon which the private sector can anchor future inflation expectations. It also has the advantage of being simple and easily communicable, and thereby well understood by the public. However, focusing exclusively on inflation also has its disadvantages. First, certain components of inflation such as food and fuel cannot be directly controlled by the monetary policy. Second, the long and variable lags in monetary policy transmission makes targeting inflation a medium term approach. Finally, overarching emphasis on achieving the targeted inflation can adversely impact growth and employment prospects.

The UPCR favours the use of the all India Consumer Price Index Combined inflation against the traditional Wholesale Price Index (WPI) inflation as the inflation metric. This is primarily driven by the CPI Combined index capturing price movements in service sectors, which accounts for nearly two-thirds of GDP. This index is also subject to marginal revisions, critical for policy formulations as large revisions result in uncertainty in the assessment of inflation conditions. Moreover, CPI Combined has the advantage of capturing more accurately the true inflation that the consumer faces in the retail market.

On the choice of headline versus core inflation, UPCR shows a preference for headline inflation, including food and fuel inflation. The latter tends to have an important bearing on aggregate inflation expectations as it gets manifested in the inflation of other items with a lag. Moreover, UPCR also notes that shocks to food and fuel inflation have a larger and more persistent impact on inflation expectations compared to non-food inflation. At the same time, the construction of the consumption basket makes it difficult to completely isolate the impact of food and fuel inflation. Exclusion of food and fuel inflation results in discarding around 57 percent of the consumption basket. However, even with the exclusion of food and fuel inflation, other components of the consumption basket such as transport and communication are impacted by change in diesel and petrol prices, and further segregation is not possible as item level disaggregated price index is not available. For these reasons the UPCR focuses on CPI Combined inflation recognising that a part of the inflation would be outside the ambit of the monetary policy.

In selecting a numerical target, the UPCR relies on both comparator emerging market economies as well as India's historical experience. The literature points out that while in advanced economies an inflation rate of 1 percent to 3 percent is viewed as acceptable, in emerging markets, acceptable inflation rate tends to be around 4 percent to 5 percent. Using empirical methods, the report finds that during the period from 2003-04Q3 to 2006-07Q1, when India's output gap was fairly close to zero, CPI inflation averaged 4 percent. Similarly using quarterly data from 1996-97 to 2012-13, the report finds CPI-Combined inflation of above 6.2 percent is inimical to growth. Based on this analysis, UPCR recommends that the nominal anchor should be set at 4 percent with a band of ±2 percent around it. The UPCR stipulates a period of two years to achieve the inflation target. This is based on the costs imposed by high inflation in the form of real effective exchange rate (REER) appreciation, high current account deficit, erosion of financial savings and resultant decline in financial saving and investment that hampers growth.

The UPCR also lays down some of the key changes in the institutional framework required to undertake a successful transition to an inflation targeting regime. A key precondition is to follow a path of fiscal consolidation so that a loose fiscal policy does not impede the monetary

transmission. The report also recommends the elimination of various administered prices, wages and interest rates that hinder the smooth transmission of monetary policy.

3. Taylor Rule Estimation

In order to find out whether the macroeconomic environment in India is indeed ready for the implementation of an inflation targeting framework, it is also important to understand the relative weights placed by the RBI on varying policy objectives within the framework of a conventional monetary policy rule. The RBI has mostly followed a pragmatic approach towards monetary policy responding to the state of the economy in a seemingly discretionary manner best outlined by a former Deputy Governor of RBI as follows, "….the overall objective has had to be approached in a flexible and time variant manner with *a continuous rebalancing of priority between growth and price stability*, depending on underlying macroeconomic and financial conditions" (Mohan 2006). Since Indian monetary policy is conducted in a highly discretionary manner, and somewhat non-transparently, our empirical analyses using past time-series data can provide important insights into the "revealed preferences" of the RBI.

Theoretical studies that derive optimal monetary policy rules, and empirical studies that investigate their use in practice, are now commonplace in the literature (e.g. Taylor, 1993; Clarida, Gali, Gertler, 2000; Woodford, 2001). Taylor (1993) formulated a policy rule by which the U.S. Federal Reserve adjusts the policy rate in response to past inflation and output gap (actual less potential output). Many studies subsequently applied and developed this class of policy rule to examine the behavior of central banks in industrialized countries (e.g., Clarida et al., 2000), as well as to emerging economies. In what follows we investigate whether the RBI's seemingly discretionary approach can in practice, be described by a Taylor-type rule in the same spirit as Hutchison, Sengupta and Singh (2010), Mohanty and Klau (2005) and Virmani (2004).

3.1. Brief background of Indian Monetary Policy

The monetary policy framework in India and the associated operating procedure have evolved over time. The structural reforms and financial liberalization of the 1990s marked a paradigm shift. Swings in capital flows and rising volatility of the exchange rate made it difficult to target monetary aggregates. Interest rates and the exchange rate began to be increasingly market determined. The RBI was able to move away from direct instruments to indirect market-based instruments in its liquidity management operations. By 1997, Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR) were brought down. RBI broadly followed the monetary targeting rule from mid-1980s till around 1997-98.

In April 1998, RBI adopted a 'multiple indicator approach' with greater emphasis on interest rate and exchange rate channels for monetary policy transmission, relative to quantity instruments. Under the multiple indicator approach, which is currently in use, a number of variables such as money, credit, output, merchandise trade, capital flows and fiscal situation as well as interest rates, rates of return in different financial markets, inflation rate and exchange rate are analyzed for drawing monetary policy inferences.

The RBI also introduced the Interim Liquidity Adjustment Facility (ILAF) in April 1999, under which liquidity injection was done at the bank rate and liquidity absorption was through fixed reverse repo rate. The ILAF gradually transitioned into a full-fledged liquidity adjustment facility (LAF) that was operated through overnight fixed rate repo and reverse repo from November 2004 onwards. The LAF helped to develop interest rate as an instrument of monetary transmission.

In the process, two major weaknesses were revealed in the functioning of monetary policy. First was lack of a single policy rate. The operating policy rate alternated between repo and reverse repo rates depending upon the prevailing liquidity condition. In a surplus liquidity condition, the operating policy rate was the reverse repo rate, while in a deficit liquidity situation it was the repo rate. Second was the lack of a firm corridor. The overnight interest rates dipped below the reverse repo rate in surplus conditions and rose above the repo rate in deficit conditions. Moreover, overnight call rates became unbounded under occasional liquidity stress. Thus, more often the overnight interest rate remained outside the corridor.

In May 2011, the RBI announced a revised monetary policy operating procedure based on the recommendations of a committee constituted for the purpose. The new operating procedure retained the essential features of the LAF framework with a few key modifications.

- First, the weighted average overnight call money rate was explicitly recognized as the operating target of monetary policy.
- Second, the repo rate was made the only one independently varying policy rate.
- Third, a new Marginal Standing Facility (MSF) was instituted under which scheduled commercial banks (SCBs) could borrow overnight at their discretion up to 1% of their respective NDTL (banks' net demand and time liabilities) at 100 basis points above the repo rate.
- Fourth, the revised corridor was defined with a fixed width of 200 basis points. The repo rate was placed in the middle of the corridor, with the reverse repo rate 100 basis points below it and the MSF rate 100 basis points above it.

The new operating framework with the modified LAF presupposes the dominance of the interest rate channel of monetary transmission. This implies that once the RBI changes the policy repo

rate, it should immediately impact the overnight interest rate, which is the operational rate and then transmit through the term structure of interest rates as well as bank lending rates.

3.2. Data and Empirical Methodology

Against the above background we split our sample into sub-periods based on major changes in the monetary policy framework. We use quarterly data from 1990 to 2013 and estimate the Taylor rule for three separate windows: 1990Q1-1998Q1; 1998Q2-2004Q3 and 2004Q4-2013Q2. The break in 1998 reflects the adoption of the multiple indicator approach and the one in 2004 coincides with implementation of the LAF. We first estimate a standard Taylor rule based on the hypothesis that the RBI reacts to both the output gap and inflation while setting the policy interest rate.[2] We also augment the standard Taylor Rule by incorporating exchange rate change as a third objective, given its significance in previous work (Hutchison, Sengupta and Singh, 2010; Mohanty and Klau, 2005):

$$i_t = \alpha + \beta y_t + \chi \pi_t + \delta \Delta e_t + \varepsilon_t \quad (1)$$

Where, i_t is the nominal interest rate, y_t is the output gap (deviation of actual output from potential output), π_t is the inflation rate at time t (assuming a constant inflation target such that the target is subsumed in the constant term of the equation) and Δe_t is the first difference of the log of nominal exchange rate. According to the Taylor Rule, the estimated coefficients of equation (5), β, χ and δ should all have positive signs. The rule thus implies that interest rate should go up when actual output exceeds the potential output, when inflation goes up or when exchange rate depreciates. We estimate equation (5) for the three sub-sample periods mentioned above.

For the empirical estimation, we use the overnight call or money market rate for the policy rate. As regards the potential output level, unlike developed countries, in India there are no official measures. We derive the output gap using the standard Hodrick-Prescott (HP) filter for measuring trend output and taking the residual of HP filter. We use the Index of Industrial Production (IIP) as a measure of output.[3] We calculate year-on-year inflation using percentage changes in the

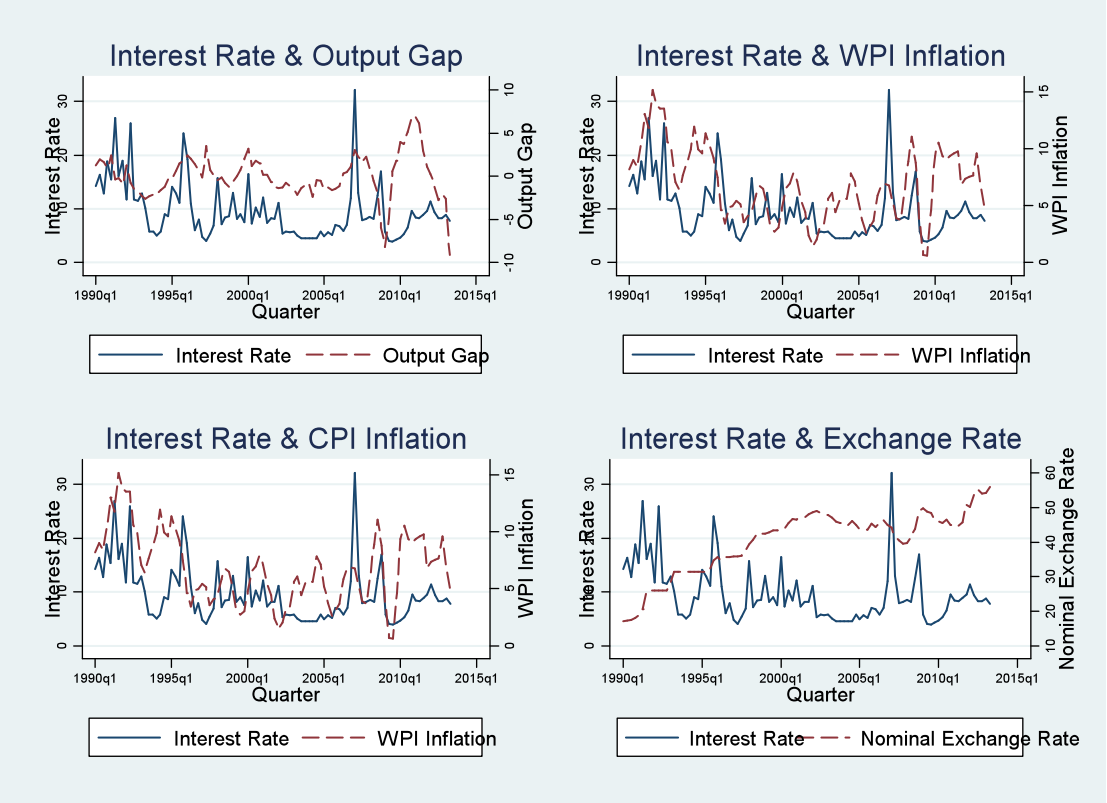
[2] The Taylor rule is a well defined monetary policy rule that throws light on a central bank's stance with regard to multiple objectives at the same time such as output gap, inflation rate and exchange rate and it also helps estimate the extent of persistence in the monetary policy. Hence, in order to assess the importance assigned by the RBI to inflation as compared to other objectives of monetary policy, we consider estimating the Taylor Rule an appropriate empirical mechanism.

[3] Ideally, we could have liked to use GDP to calculate the output gap. However, we are constrained by the unavailability of quarterly data on GDP for India before 1996-97. Hence, we use quarterly data for IIP which is available from the start of our sample period; it reflects the movement in the industrial sector, which accounts for 25% to 30% of the Indian economy.

Wholesale Price Index (WPI) as well as the Consumer Price Index for Industrial Workers (CPI-IW) given that the latter has received significant policy attention in recent times especially in light of the UPCR.

Prior to estimations, we conduct unit root tests (Augmented Dickey-Fuller, Phillips-Perron, Elliott-Rothenberg-Stock and Kwiatkowski-Phillips-Schmidt-Shin tests) and results suggest presence of unit root in the exchange rate series in levels, but we find that the first difference of the series is stationary. Accordingly, we use first difference of the nominal exchange rate as specified in equation (5) above. We also run the Durbin Watson and Breusch-Godfrey tests that reveal the presence of serial correlation and the Breusch-Pagan/Cook-Weisberg test that shows presence of heteroskedasticity in error terms. Accordingly, we estimate our baseline model given in equation (5) using ordinary least squares regression with Newey-West variance-covariance matrix, in order to correct for both autocorrelation and heteroskedasticity. We have also de-seasonalized the series using the Census X12 procedure.

Figure 1: Relationship between Interest Rate and Key Macroeconomic Variables



Source: Database on Indian Economy and Authors' Calculations

The Woodford (2001) version of the Taylor Rule for an open economy expresses the policy interest rate as a function of the output gap, inflation target, the exchange rate and lagged interest

rate. Hence we further augment equation (1) by adding lagged interest rate in order to capture inertial in optimal monetary policy or interest rate persistence.

$$i_t = \alpha + \beta y_t + \chi \pi_t + \delta \Delta e_t + \gamma i_{t-1} + \varepsilon_t \quad (2)$$

This equation is also estimated for three sub-periods. Figure (1) above shows the evolution of the output gap, inflation (WPI and CPI), and nominal exchange rate series along with overnight interest rate during the sample period.

3.3. Discussion of results

The results of estimating equations (1) and (2) are given in Tables (1) and (2) respectively. The first three columns of Table (1) show the results for estimating equation (1) using WPI to measure inflation whereas the last three columns show results, with inflation calculated using CPI. Columns 1 and 4 truncate the sample at 1998Q1, and columns 2 and 5 truncate the sample at 2004Q3. Each of these truncations represents a plausible break point from the perspective of changes in conduct of Indian monetary policy, as outlined in section 3.1 above. All the estimated coefficients whenever significant have the expected positive sign as predicted by theory implying that RBI has on average raised interest rate when output has been above its potential level or inflation has gone up or the nominal exchange rate change has been positive i.e. exchange rate has depreciated.

Table (2) shows results for estimating the baseline Taylor Rule with lagged interest rate. Results are similar to Table (1) and we also find that interest rate has exhibited higher persistence in the final sub-period i.e. the inertia in monetary policy has been much higher in recent times.

It can be further seen from the table that output gap is statistically significant only during 1998Q2-2004Q3 irrespective of the index used to measure inflation, implying that the RBI has not always been consistently responsive to output growth per se. The effective responsiveness to output gap depends on adjusting for the magnitude of lagged interest rate coefficient (Hutchison, Sengupta, Singh, 2010). Clearly the interest rate persistence does not seem to have affected output gap during the period 1998Q2-2004Q3 as shown the similar magnitude of raw coefficients of output gap across the two tables.

WPI inflation seems to have been relatively important during the first and last sub-periods whereas CPI inflation has been consistently significant during 1990Q1-2004Q3 but not in the most recent period. The estimated coefficient of CPI inflation is greater than 1 in both Table 1 and and Table 2 (when adjusted for the lagged interest rate) for the period 1990Q1-1998Q1 indicating a strong policy response to inflation during the early years of the sample period. The magnitude

of the WPI inflation coefficient though close but never exceeds 1 even when adjusted for interest rate persistence. Thus, historically the central bank seems to have put greater emphasis on inflation rate compared to output gap.

Table 1: Taylor Rule Estimation: Without Interest Rate Persistence

	Using WPI Inflation			Using CPI Inflation		
Variables	1990Q1 to 1998Q1	1998Q2 to 2004Q3	2004Q4 to 2013Q2	1990Q1 to 1998Q1	1998Q2 to 2004Q3	2004Q4 to 2013Q2
Output Gap	1.104	1.314***	0.008	0.424	1.608***	0.215
	(0.651)	(0.333)	(0.179)	(0.711)	(0.386)	(0.181)
Inflation Rate	0.806***	-0.221	0.452**	1.108***	0.270**	-0.218
	(0.280)	(0.291)	(0.215)	(0.314)	(0.097)	(0.312)
Change in Exchange Rate	34.957	9.177	6.703	36.171	-27.503	22.611
	(23.715)	(26.406)	(21.604)	(24.447)	(29.909)	(24.482)
Constant	4.252	9.210***	5.631***	0.445	6.981***	10.266***
	(2.709)	(1.407)	(1.617)	(3.181)	(0.693)	(3.192)
R^2	0.327	0.372	0.073	0.364	0.448	0.046
No. of Observations	32	26	35	32	26	35

Note: Robust Newey West Standard errors in parentheses. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Source: Authors' calculations

Table 2: Taylor Rule Estimation: With Interest Rate Persistence

	Using WPI Inflation			Using CPI Inflation		
Variables	1990Q1 to 1998Q1	1998Q2 to 2004Q3	2004Q4 to 2013Q2	1990Q1 to 1998Q1	1998Q2 to 2004Q3	2004Q4 to 2013Q2
Output Gap	0.801	1.328***	0.121	0.288	1.641***	0.288
	(0.567)	(0.372)	(0.172)	(0.597)	(0.439)	(0.186)
Inflation Rate	0.636**	-0.229	0.365**	0.918**	0.276**	-0.160
	(0.288)	(0.308)	(0.149)	(0.371)	(0.107)	(0.186)
Change in Exchange Rate	25.255	11.191	15.312	27.728	-24.800	28.100
	(23.301)	(30.006)	(14.103)	(23.519)	(30.125)	(18.711)
Lagged Interest Rate	0.235	-0.024	0.413***	0.198	-0.044	0.421***
	(0.162)	(0.173)	(0.110)	(0.180)	(0.169)	(0.115)
Constant	3.133	9,437***	2.629**	0.118	7.309***	6.161***
	(2.755)	(2.331)	(1.014)	(2.913)	(1.477)	(2.200)
R^2	0.362	0.372	0.241	0.389	0.449	0.221
No. of Observations	32	26	35	32	26	35

Note: Robust Newey West Standard errors in parentheses. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Source: Auhors' calculations

However the magnitude of the inflation coefficients for both indices has dramatically gone down over the years—in fact for WPI inflation, both with and without interest rate persistence taken into account, the coefficients have almost halved between the first and last sub-periods. Also while WPI inflation is statistically significant at the 5% confidence level during 2004Q4-2013Q2, not only is CPI inflation not significant, its coefficient turns negative. A plausible reason for the insignificant coefficient on CPI inflation in the last sub-period could be the widening gap between CPI and WPI inflation, especially during the latter half of this sub-period, owing to a surge in food prices. Food inflation affects WPI and CPI inflation in a disproportionate manner due to the higher weight of food items in the CPI basket compared to the WPI basket. Another likely reason could be that the central bank was responding to the rise in inflation during the second half of the sub-period only in an incremental and lagged manner.

Going purely by WPI inflation, coefficient magnitudes and statistical significance, it seems that the though the relative importance assigned to inflation has diminished during the second sub-period (1998Q2-2004Q3), it has been somewhat recovered in recent times. If we consider CPI inflation however, the importance assigned to it seems to have declined over the sample period. Hence, when it comes to weight assigned by the RBI to inflation in monetary policy, clearly the index of measurement matters.

We further find that in line with the RBI's own policy stance, exchange rate movements do not constitute a systematically important determinant of its monetary policy conduct over the entire sample period-a result also consistent with earlier findings in Hutchison, Sengupta and Singh (2010). In none of the sub-periods do we find the estimated coefficients of exchange rate change to be statistically significant, irrespective of whether we take into account inertia in monetary policy.

Overall, our results seem to indicate that inflation matters more than output gap if we are to use Taylor Rule to understand Indian monetary policy, there has been greater sensitivity to WPI inflation in recent times compared to CPI, exchange rate changes do not seem to play a crucial role and post-2004 conduct of monetary policy seems to have changed in the direction of greater inertia.

A comparison of the interest rate predicted by specifications outlined in Table (2) with the actual interest rate yields interesting results. In the case of CPI inflation, during the period 1990Q1 to 1998Q1, the Taylor Rule predicted rate was on average around 3 percentage points lower than the prevailing interest rates. During the second sub-period, we find that on average prevailing interest rates were in line with the rates predicted by the Taylor Rule. Finally, in the third sub-period we find monetary policy to be tad loose with interest rates predicted by the Taylor Rule being around 1.5 percentage points higher than prevailing interest rates.

4. Issues under an Inflation Targeting Regime

The move towards an inflation targeting regime marks a significant departure from the traditional multiple indicator approach. This would entail the central bank confronting a number of issues. Below, we describe a few key challenges that the RBI would have to overcome as it moves towards an inflation targeting regime. These include (a) managing the impossible trinity; (b) deciding upon the inflation metric to use as a target; (c) determining the appropriateness of the numerical target; and (d) assessing the impact of fiscal dominance. We understand that this is not an exhaustive list of the challenges being faced by a central bank as it aims to undertake a transition to an inflation targeting regime.[4] Mahajan et al.(2014) highlight a number of other issues including absence of well-developed capital markets and accurate forecasting techniques.

4.1 How to manage the impossible trinity?

A fundamental contribution of the Mundell-Fleming framework is the impossible trinity, which states that a country may choose any two, but not all of the following three goals at the same time: monetary independence, exchange rate stability and capital account openness or financial integration (Aizenman, et al., 2008). Under this standard framework of the impossible trinity, given India's enhanced integration with global capital markets, there would be a tension between monetary independence and exchange rate management.[5] The adoption of an inflation targeting mechanism would result in the central bank relinquishing exchange rate management in favour of greater monetary independence. This could prove to be perilous given the sharp increase in volatility of capital flows in recent years. The central bank has grappled with the impossible trinity over the last several years. Below we use empirical methods to describe briefly India's experience with impossible trinity using quarterly data from 2000 Q1 to 2013 Q4.[6]

Monetary Independence (MI)

Following Aizenman et al. (2010), the extent of monetary independence is measured as the inverse of the quarterly correlation of the interest rates between India and the US. The quarterly indices are calculated using weekly 3-month Treasury Bill yields for India and the US. The index of Monetary Independence is given by

$$\mathrm{MI} = 1 - \frac{corr\left(i_{IND}, i_{US}\right) - \left(-1\right)}{1 - \left(-1\right)} \tag{3}$$

[4] For instance, in India the government bond market is much less developed compared to the same in OECD countries or for that matter other major emerging economies and the corporate bond market is even more illiquid-both of which pose significant constraints in an effective monetary transmission which in turn might hamper the successful implementation of an inflation targeting strategy. See Anand and Sengupta (2014), Banerji et. al (2012) and Mitra (2009) for a detailed discussion of the Indian corporate debt market.

[5] The Impossible Trinity or the Trilemma points out that that it is impossible to attain monetary policy independence, exchange rate stability and capital market integration simultaneously. Only two of the three objectives can be obtained at a particular point in time.

[6] For more details on construction of these indices please refer to Sen Gupta and Sengupta (2013)

where corr (iIND,iUS), refers to the correlation of the interest rates over a quarter and provides evidence on co-movement of domestic and foreign interest rates. A higher value of the index refers greater degree of monetary independence.

Exchange Rate Stability (ERS)

We use the methodology introduced by Frankel and Wei (1994) to create an index of exchange rate stability. The degree of influence that major global currencies have on Indian Rupee can be estimated using the following estimation model

$$\Delta \log \varepsilon_{INR,t}^{CHF} = \alpha_0 + \beta_{US} \Delta \log \varepsilon_{USD,t}^{CHF} + \beta_{EUR} \Delta \log \varepsilon_{EUR,t}^{CHF} + \beta_{JAP} \Delta \log \varepsilon_{JPY,t}^{CHF} + \mu \qquad (4)$$

Where $\varepsilon_{i,t}^{CHF}$ is the exchange rate of currency i against the numèraire currency, which in this case is the Swiss franc where currency i can be the US Dollar, Japanese Yen and the Euro. Under this estimation, $\hat{\beta}_i$ which is the estimated coefficient on the rate at which currency i depreciates against the numèraire currency indicates the weight of currency i in the basket. In the case where the currency under observation is pegged to a particular currency or a basket of currency we will have $\hat{\beta}_i = 1$ or $\sum_{i=1}^{I} \hat{\beta}_i = 1$ for i currencies that are a part of the basket. Moreover, pegging to an individual or a basket of currencies implies a higher goodness of fit. We apply the estimation over a quarter and take the goodness of fit, or the adjusted R^2 as the measure of exchange rate stability. A higher R^2 indicates greater pegging to an individual or a basket of currencies.

Capital Account Openness (KO)

The index of capital account openness is based on a *de facto* measure of openness, as it is the actual volume of flows that creates a conflict between monetary independence and exchange rate stability as opposed to controls governing the movement of capital. The index of capital account openness, KO, is based on net capital flows, and is constructed as the ratio of absolute value of net capital flows to GDP.

$$\text{KO} = \frac{\left|\text{Net Capital Flows}\right|}{\text{GDP}} \qquad (5)$$

To make the indices comparable, all the indices are normalized to lie between 0 and 1.[7]

[7] The normalization was done by subtracting the minimum value of the series from the index and dividing it by the difference between the maximum and minimum values.

The validity of trilemma framework in India is estimated by testing whether the weighted sum of the three trilemma policy variables adds up to a constant – here set to be 2.[8]

$$2 = \alpha MI_t + \beta ERS_t + \gamma KO_t \quad (6)$$

Using the methodology outlined in Bai and Perron (2003) to identify structural breaks, we find that the exchange rate regime in India can be classified into four distinct phases. These are: Phase I: 2000 Q1 to 2005 Q3; Phase II: 2005 Q4 to 2008 Q3; Phase III: 2008 Q4 to 2011 Q3 and Phase IV 2011 Q3 to 2013 Q4. We find that the overall fit is extremely high with R^2 being above 0.93 across all the specifications, implying that the linear trilemma specification is a good approximation for India (Table (3)). While the estimates for exchange rate stability and capital account openness are significant across all the specifications, it is not the case with monetary independence.

To obtain the weight assigned by the policymaker to the three different policy orientations of the trilemma we multiply the coefficients with the average for each phase (Table 4). The results are outlined in Figure 2.

Table 3: Testing the Validity of the Trilemma Framework

VARIABLES	Phase I	Phase II	Phase III	Phase IV
Exchange Rate Stability	2.007**	2.013**	2.250**	3.357**
	(0.046)	(0.352)	(0.683)	(0.528)
Monetary Independence	0.017	0.924+	1.154+	1.617**
	(0.072)	(0.452)	(0.539)	(0.391)
Capital Account Openness	0.389*	0.210**	1.222**	2.089*
	(0.191)	(0.010)	(0.234)	(0.665)
R^2	0.997	0.955	0.957	0.966
Number of Observations	23	12	12	9

Robust standard errors in parentheses ***p<0.01, * *p<0.05, *p<0.1

Source: Authors' calculations

[8] If the Trilemma is indeed binding then a country, which chooses to implement any 2 of the 3 policy objectives perfectly will have to completely forego the third objective. Hence in our analysis where all the trilemma objectives are normalized to lie between 0 and 1, the maximum combined value of the Trilemma indices can be 2.

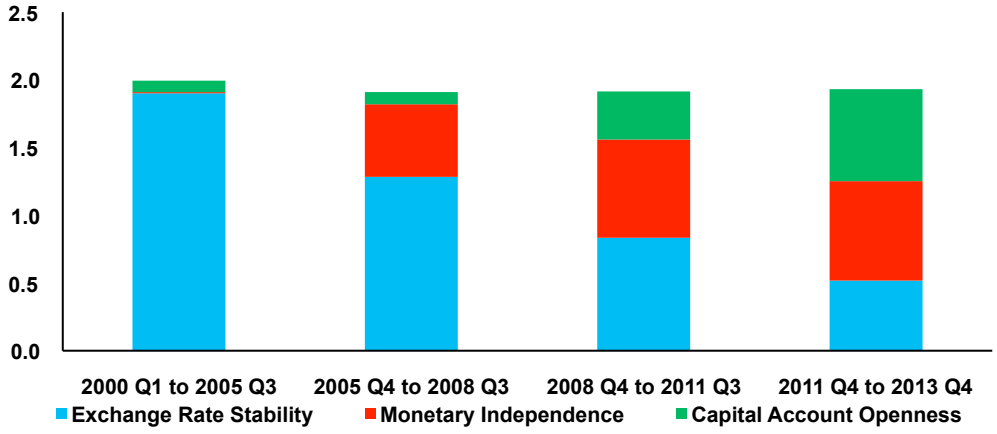
Table 4: Average Values of the Trilemma Indices

VARIABLES	Phase I	Phase II	Phase III	Phase IV
Exchange Rate Stability	0.947	0.638	0.371	0.154
Monetary Independence	0.499	0.580	0.629	0.454
Capital Account Openness	0.218	0.429	0.291	0.325

Source: Authors' calculations

It is clearly evident that across the phases there has been a decline in the weight assigned to exchange rate stability. In Phase I exchange rate stability was the overwhelmingly dominant objective of the policymakers. However, by Phase IV the weight assigned to this objective had dropped to a third of that in Phase I. The Rupee appreciated by nearly 17 percent between March 2009 and April 2010. Similarly, between August 2011 and December 2011, the Rupee depreciated by 19 percent on the back of a widening current account deficit and weak capital inflows. The Rupee witnessed heightened volatility in 2013 as well. A high current account deficit and signals of tapering of the quantitative easing by the Federal Reserve in the USA resulted in the Rupee depreciating by 21 percent between May and August 2013. The various policy measures introduced to curb the current account deficit and enhance capital inflows helped the Rupee strengthen by 11 percent by November 2013.

Figure 2: Contributions to Policy Trilemma



Source: Authors' calculations

In contrast there has been a steady increase in both capital account openness and monetary independence. The rise in capital account openness has been driven by India's increased integration with global capital markets. While gross capital flows as a percentage of GDP increased from 21 percent in 2000-01 to 52.1 percent in 2013-14, net capital flows rose from 1.9 percent to 2.6 percent.

At the same time, the central bank pursued a more independent monetary policy. After the initial softening of monetary policy to stimulate growth, the RBI started tightening the monetary policy from March 2010 in response to high and persistent inflation. This was in contrast with the advanced economies, which were continuing to follow a soft monetary policy to stimulate growth. The increase in monetary independence in Phase II and Phase III is in line with the finding in Section 3.3 that interest rate was positively targeting WPI inflation rate during the period 2004 Q4 to 2013 Q2.

Given the overall shift in policy orientation with an increased emphasis on monetary independence along with a reduced focus on stabilizing the exchange rate, the RBI seems to be well placed to move towards inflation targeting. However, if the RBI wishes to proceed on this path it would have to relinquish its focus on ensuring orderly movement in the exchange rate. This would be in sharp contrast to some recent actions taken by the central bank. In mid-2013, the RBI mounted an interest rate defense as the Rupee depreciated by nearly 20 percent between April and August 2013. This was done by resetting overnight rates higher in order to increase the cost of carry for the rupee and thereby discourage speculation. This resulted in a sharp inversion of the yield curve with the short-term rate being more than 150 basis points higher than the long tenor government bonds. The hike in the short-term rates was also undertaken with a view to increase the relative interest rate differential with advanced economies, and stem debt outflows.

Furthermore, a completely flexible exchange rate regime would prevent the central bank from shoring up reserves and restore reserve adequacy, which has deteriorated considerably in recent times. The import cover of reserves more than halved from around 15 months at the end of March 2008 to 6.6 months at the end of September 2013. Over the same period the ratio of volatile capital flows (short-term debt and cumulative portfolio inflows) to reserves increased from 44.4 percent to 97.3 percent. A bid to rebuild India's reserves involves the central bank resisting appreciation of the currency by intervening substantially in the foreign exchange market during periods of capital inflow surge, as was done between January 2005 and April 2008, when RBI purchased $128 billion of foreign assets.

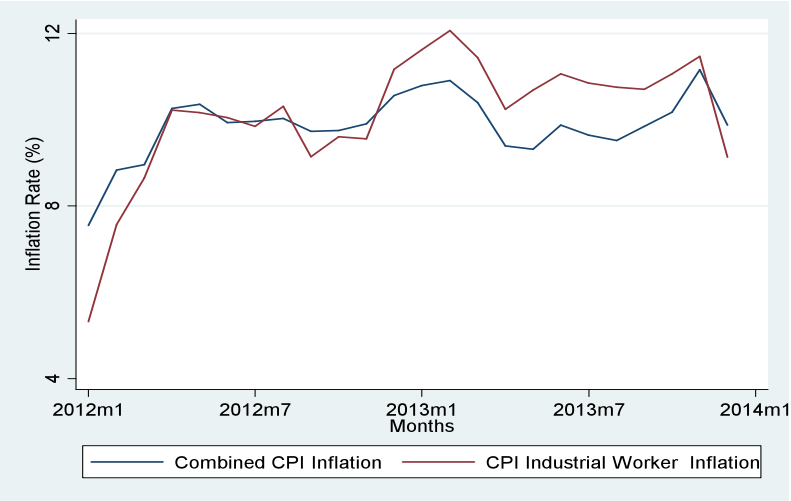
4.2 Which inflation to target?

The UPCR recognizes that some parts of inflation such as food and fuel inflation are not directly controlled by the monetary policy. This raises the questions about the appropriateness of targeting the headline inflation given that it is significantly less amenable to monetary policy actions (Mahajan et al., 2014). Furthermore, with an increase in the financialization of commodities through derivatives, headline inflation is likely to become more volatile.

In this section we use empirical tools to identify the main drivers of aggregate CPI inflation, and distinguish the roles played by the demand and supply side drivers. We use quarterly data from Q2 1996 to Q4 2013 i.e. a span of 71 quarters. The choice of the initial period is driven by the availability of data, especially for quarterly GDP.

The dependent variable is quarterly average of aggregate CPI inflation. This is based on taking the average of monthly CPI Industrial Worker (CPI-IW) inflation. The use of CPI-IW (base 2000=100) inflation is necessitated by the limited availability of new CPI Combined inflation, which is available only from January 2012. CPI-IW inflation works as a good substitute given its high degree of co-movement with CPI-Combined inflation during January 2012 to December 2013 (Figure (3)).

Figure 3: Co-movement of Inflation Rates



Source: Database on Indian Economy

A number of factors have been found in the literature to influence inflation. Food prices are a major determinant of CPI inflation as food accounts for almost 50 percent of the CPI consumption basket, which implies a 4 percent increase in food prices has the potential to raise CPI inflation by 200 basis points. This is significantly higher than most other large emerging markets such Brazil, China and South Africa. With agriculture output influencing food price movements, we use quarterly data on agriculture GDP to evaluate the role of food prices in influencing CPI inflation.

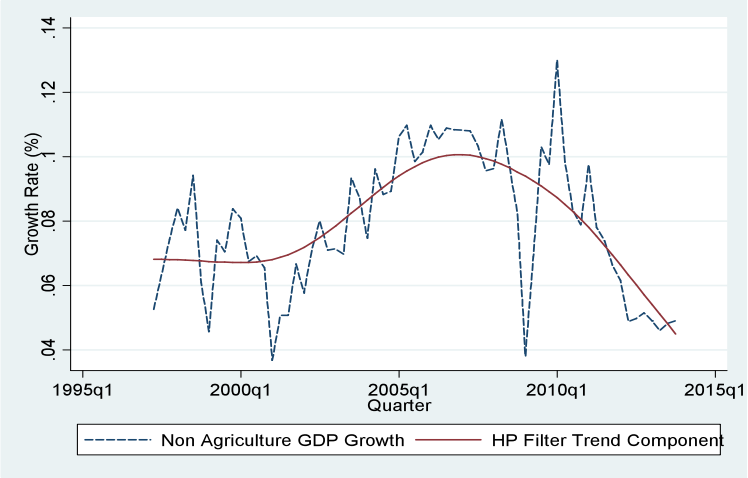
Another major driver of inflation is fuel inflation. Assuming the cost of crude oil (Indian Basket) stabilizes around $105, the under recoveries of the oil market companies could be eliminated by 2015 if the monthly diesel price hikes continue. The data on fuel inflation is taken from Fuel and

Light component of CPI-IW. Money supply is another major determinant of inflation. An increase in money supply in excess of economic growth could result in higher prices.

We use the log values of CPI, agriculture GDP, money supply and CPI fuel after adjusting them for seasonal variation. Seasonal adjustment is done by using the X12 Seasonal Adjustment Program of the US Census. We find the presence of multiplicative seasonality in these variables. Next, we undertake the Augmented Dickey Fuller unit root tests for the aforementioned variables, and find that the variables are integrated of order 1 or are I(1). This implies that the variables are non-stationary in levels but stationary when first differences are taken.

To capture the demand side pressures on inflation we focus on non-agricultural output gap in terms of growth rate. The output gap is computed using the Hodrick-Prescott filter (Figure 4). If the economy is growing at a rate higher than the potential growth rate, the economy tends to overheat resulting in higher inflation.

Figure 4: HP Filtered Quarterly GDP Growth Rate



Source: Database on Indian Economy and Authors' Calculation

The nominal exchange rate also has an important bearing on CPI inflation. A weakening of the domestic currency can introduce inflationary pressures by raising the cost of imported goods. However, the exact extent of pass through depends on the pricing power of the firm, which has been curtailed to some extent in recent years due to weak demand.

Table 5: Determinants of Consumer Price Index Inflation

VARIABLES	(1)	(2)	(3)	(4)	(5)
Constant	-0.146	0.103	0.030	-0.011	-0.146
	(-0.764)	(0.403)	(0.136)	(-0.048)	(-0.609)
Lagged CPI	0.859***	0.923***	0.9552***	0.946***	0.903***
	(58.740)	(46.072)	(37.196)	(38.660)	(27.908)
Agriculture GDP	-0.023	-0.012	-0.008	-0.008**	-0.038**
	(-0.626)	(-0.279)	(-1.199)	(-1.972)	(-1.974)
Exchange Rate		0.027*	0.010	0.003*	0.039**
		(1.756)	(1.542)	(1.815)	(1.999)
CPI Fuel			0.035*	0.030**	0.066***
			(-1.857)	(-1.920)	(-2.799)
Non Agricultural Output Gap				0.0186**	0.020**
				(1.985)	(1.953)
Broad Money Supply					0.035**
					(2.452)
R^2	0.991	0.989	0.993	0.992	0.995
Number of Observations	70	70	70	67	67

Robust t statistics in parentheses ** p<0.01, * p<0.05, + p<0.1

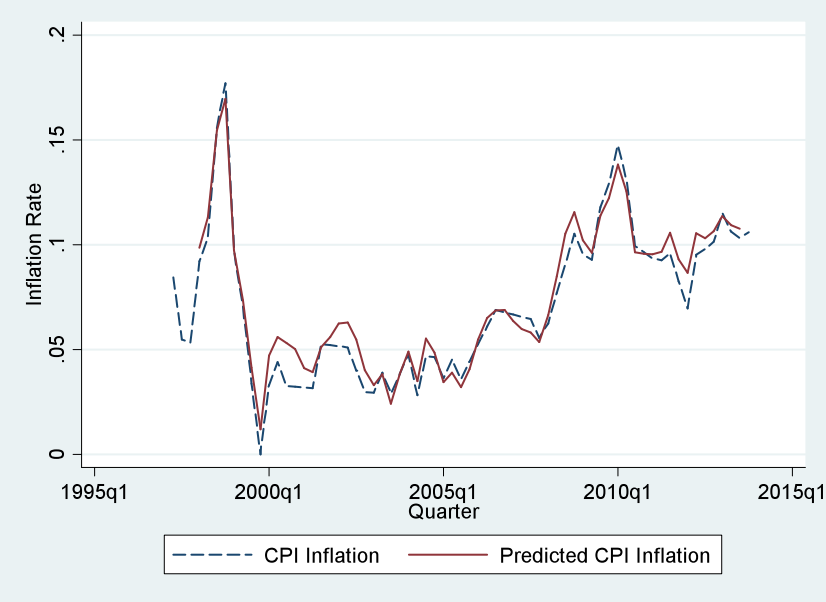
Source: Database on Indian Economy and Authors' Calculation

Data on CPI and CPI-Fuel are sourced from Labour Bureau, Government of India, while data on agriculture GDP and non-agricultural growth rate are obtained from Central Statistical Organisation. Finally, data on exchange rate and money supply is taken from Database on the Indian Economy, Reserve Bank of India.

We employ dynamic least squares estimation with lagged dependent variable to identify the key drivers of inflation. The results are reported in Table (5), where we incrementally add the impact of the various drivers. Not surprisingly, we find the lagged dependent variable to have a significant positive impact across all specifications, implying that price rise has been very persistent in India. Agriculture output negatively impacts inflation, but the effect is not significant across all specifications. In contrast, exchange rate, defined as the value of foreign currency in domestic currency has a positive significant impact on prices across most specifications. Thus an increase in exchange rate, i.e. a depreciation of the domestic currency, raises prices level.

Both fuel prices and broad money supply also exert a positive significant impact on inflation across the various specifications. Finally, when we introduce non-agricultural output gap as a proxy for demand side pressures we find that it also have a positive significant impact on CPI inflation. In Figure 5, when we plot the actual path of CPI inflation with the inflation rate predicted by the regression specification outlined in Column (5) of Table (5), we find a close match between the two indicating our model is well specified.

Figure 5: Actual and Predicted Inflation Rate



Source: Database on Indian Economy and Authors' Calculation

On balance, we find that factors, which are traditionally outside the control of monetary policy such as agriculture output, fuel inflation and exchange rate, do exert a strong impact on aggregate prices in India. To evaluate the extent of impact of the various variables on prices we focus on the specification outlined in Column (5) of Table (5). We find that a 1 percent increase in agriculture output is associated with a 0.39 percent decline in prices, while a 1 percent depreciation results in 0.4 percent rise in aggregate prices. Fuel prices exert a strong impact on overall inflation with a 1 percent rise in fuel prices being associated with a 0.68 percent rise in aggregate prices. In contrast, a 1 percent increase in non-agricultural output growth results in prices increasing by 0.21 percent. Finally, an increase in money supply leads to prices rising by 0.36 percent. While the above analysis is illustrative and sensitive to the specification chosen, it nevertheless points to the prominence of factors considered traditionally outside the control of monetary policy, for inflation in India.

4.3 What should be the appropriate Numerical Inflation Target?

The UPCR recommends a numerical target of 4 percent for CPI inflation with a band of ±2 percent around it. This was driven by both domestic and international factors. On the domestic front, the UPCR argues that CPI-Combined inflation above 6.2 percent is inimical to growth. Furthermore, during the period Q4 2003 and Q2 2006, when the output gap was fairly close to zero, the average CPI inflation was around 4 percent. However, these estimates are sensitive to the period under consideration. A comparison with periods immediately before and after this

period shows that the period 2003Q4 to 2006Q2 was an unusually benign period for overall inflation, with the various drivers of inflation identified in Table (5), being particularly supportive during this period to achieve a moderate inflation.

Table 6: Average Values of Key Macroeconomic Variables

	Q2 1997 to Q3 2003	Q4 2003 to Q2 2006	Q3 2006 to Q4 2013
	Phase I	Phase II	Phase III
Aggregate CPI Inflation	5.8%	4.2%	9.3%
GDP Growth	5.4%	8.7%	7.4%
Agriculture GDP Growth	1.3%	5.2%	3.7%
CPI Fuel Inflation	10.2%	2.3%	8.2%
Money Supply Growth	16.5%	15.6%	17.6%
Exchange Rate Change	-4.2%	2.1%	-3.0%
Non Agriculture GDP Growth	6.9%	9.7%	8.1%
Number of Observations	26	11	30

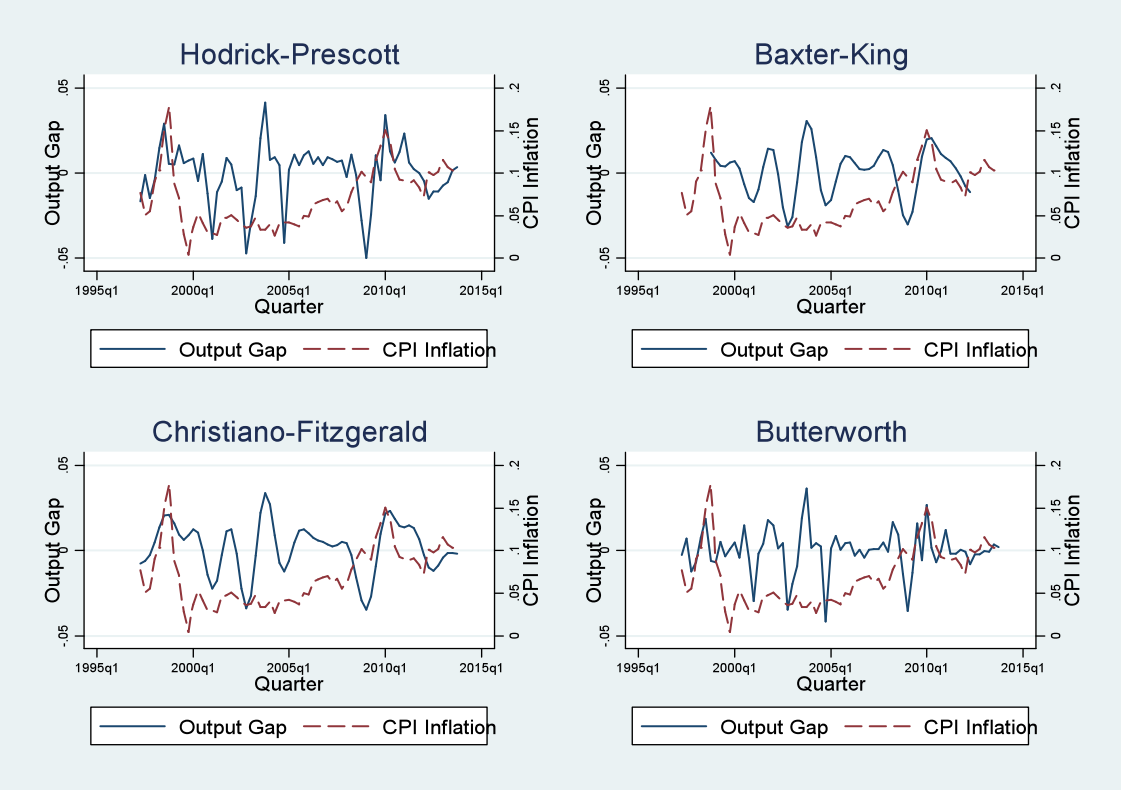
Source: Database on the Indian Economy and Authors' Calculations

As evident from Table (6), while agricultural output in Phase II, the period considered in UPCR, grew at a significantly higher rate than other phases, growth rate of CPI fuel inflation was significantly lower in Phase II. The domestic currency also strengthened in Phase II on the back of strong capital inflows, which was in contrast with the other two periods, when there was a sustained weakening of the Rupee. The growth rate in money supply was also more moderate in Phase II, despite it recording the highest GDP growth, and help in softening inflation. In contrast, the demand side pressures were higher in Phase II with non-agriculture GDP growth being the highest in Phase II.

As pointed out in UPCR and also as documented in Table (6), Phase II was associated with an average aggregate inflation of around 4 percent. However, there has been a substantial change in the structure of the economy since then in the aftermath of the Global Financial Crisis externally, and a host of structural and regulatory bottlenecks stifling growth domestically. Thus, it becomes pertinent to evaluate the change in aggregate average inflation when the latter period is taken into account. Below, we extend the analysis presented in UPCR to 2013Q4. We use four alternative methods to calculate the gap between actual and potential output growth rate. Apart from the widely used Hodrick Prescott filter, which removes a smooth trend from a time series, we also compute the output gap using the Baxter-King filter. The latter is a bandpass filter, which allows suppression of both the low frequency trend components and the high frequency components in an economic series. The Christiano-Fitzgerald random walk filter improves over the Baxter-King filter in terms of an optimality criterion, and do not lose observation. Finally, the Butterworth square-wave high pass filter has the advantage of taking into account breaks in the

underlying trend of a series. Figure 7 traces the quarterly output gap calculated across the different filters and the corresponding inflation rates.

Figure 7: Inflation and Output Gap across Different Filtering Techniques



Source: Database on Indian Economy and Authors' Calculation

Table 7: Average CPI Inflation Rates and Output Gaps

	Output Gap of ±2%	Output Gap of ±1%	Output Gap of ±0.5%
Hodrick Prescott	7.8%	7.5%	7.7%
	(34)	(24)	(12)
Baxter King	7.4%	7.1%	7.0%
	(29)	(19)	(8)
Christiano Fitzgerald	7.7%	7.7%	8.0%
	(34)	(23)	(11)
Butterworth	8.0%	7.7%	7.4%
	(37)	(32)	(27)

Note: The numbers in parenthesis denote the number of quarters during which the output gap was within the prescribed range.

Source: Database on Indian Economy and Authors' Calculation

In Table 7, we report the average inflation rates during the periods when the output gap was close to zero. In particular, we focus on three situations when the output gap lies within a

bandwidth of ±2 percent, ±1 percent and ±0.5 percent, and find that the average inflation rate ranges between 7.1 percent and 8.0 percent across the different filters and bandwidth. Thus, India's recent experience shows that periods of small output gap were associated with inflation rates that were nearly twice than the final target set by the UCPR. Hence, without altering the structure of the economy by removing the structural and procedural bottlenecks that have stifled the supply response, reduction of inflation rate to around 4 percent through tightening of monetary policy, is likely to result in significant deflationary cost. Moreover, an unusually tight monetary policy could choke off the supply response that is required to alleviate some of the supply side bottlenecks that have been driving inflation.

The UCPR recommends a glide path for the inflation rate, with the CPI inflation targeted to be down to 8 percent by January 2015 and 6 percent by January 2016, before formally adopting the 4 percent inflation target with a band of ±2 percent. However, the glide path seems significantly steep seeking to reduce the inflation rate to almost half its existing level over a period of two years. This is in sharp contrast to how some of the other developing countries have proceeded in reaching the final target. For example, in Chile, after nearly a decade in which average inflation was around 21.5%, the authorities announced in September 1990 the first inflation target range between 15% to 20%, to be reached by December 1991. The initial goal was to converge to a single digit inflation, and once that was accomplished, the final goal was to achieve the level of inflation of developing countries. Thus, from 1991 onwards, each September, the central bank, announced the inflation target that was to be attained by December of subsequent year. Schmidt Habel and Tapia (2002) show that the central bank opted for a gradual approach to inflation stabilization by announcing a new inflation target each year, which was only moderately lower than the preceding one. Over the decade 1991 to 2001, the annual inflation target was lowered by 1.5 percent per year. It was only in 1999, when inflation has converged to low stationary levels and Chile had adopted an exchange rate float, Chile moved to a full-fledged inflation targeting regime with a range of 2% to 4% and central target value of 3%. The gradualist approach was adopted considering significant backward indexation of inflation rate in Chile, which would have caused rapid disinflation to have significant output costs.

Empirical studies estimating the New Keynesian Phillips Curve in India such as Mazumdar (2011) and Patra and Kapur (2010) find strong evidence for the backward-looking specification, with the coefficients on lagged inflation being positive and significant. Hence, a rapid disinflation through monetary tightening to achieve the inflation target in a short period of time is likely to entail heavy cost.

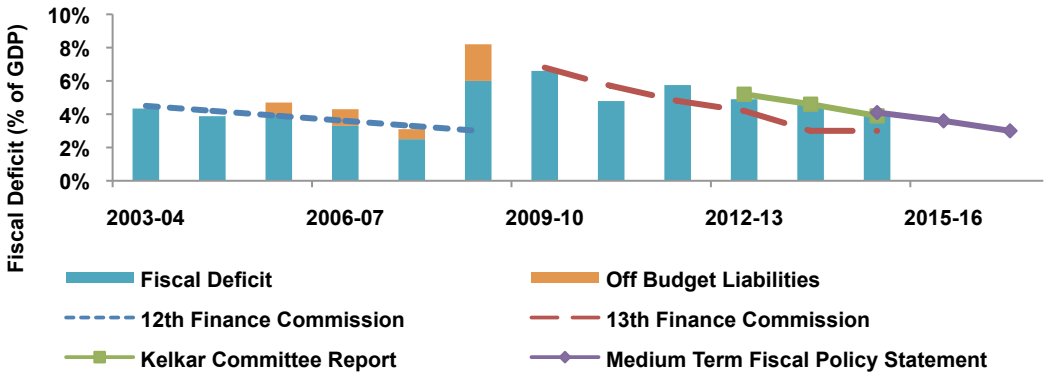
4.4 How does the fiscal policy impact Inflation Targeting?

The extent of fiscal dominance plays an important role in determining the success of an inflation targeting regime. If the central bank is dominated to the extent that it has to purchase the bonds issued by the government or lend directly to finance the deficit, then the central bank will be unable to numerically target an inflation rate. In such a situation the central bank does not have any control over the size of its own balance sheet, and therefore will be unable to influence the policy interest rate in response to an excessively high or low inflation rate. In India, the monetization of fiscal deficits was first reduced and then eliminated in 1997, with government financing being done increasingly through debt auctions entailing the discovery of risk free interest rates in the economy. Subsequently, the central bank was prohibited from buying government securities in the primary market under the Fiscal Responsibility and Budget Management (FRBM) Act from April 2006.

Blanchard (2004) and Favero and Giavazzi (2004) show that fiscal dominance can also result in unintended outcomes of monetary policy actions by altering the perception of the financial market about the ability of the government to honour its external obligations. Consider the case where the central bank has to raise interest rate in response to a demand shock with inflationary consequences. If the government's debt obligations are short-term in nature, there could be concern in financial markets about debt sustainability which, in turn would widen the risk premium on the debt. This would likely lead to a weakening of the currency, which would further aggravate inflationary pressures, in contrast to the original objective of the central bank. Again, India is relatively well placed on this front as government's external debt accounts for only 17.9 percent of the total external debt, and most of this is long term.

Finally, fiscal dominance can have impact on monetary policy through its impact on aggregate demand and inflationary expectations. With a combined fiscal deficit of around 7 percent of GDP in 2014-15, fiscal dominance encroaches on monetary policy efficiency, as the central bank has to undertake open market operations to 'manage yield'. Furthermore a rise in market borrowing by the government is associated with crowding out of private investment, which is reflected in a decline in the share of non-food credit.

Figure 8: Fiscal Deficit and Rule Based Targets



Source: Kapur and Mohan (2014) and Authors' Estimates

Simone and Topalova (2009) argue that India's experience with fiscal rules has been mixed. India introduced the FRBM Act in 2003 with the objective of eliminating revenue deficit by 2008-09 and reducing central government's fiscal deficit to 3 percent of GDP by 2008-09. However, as shown in Figure 8, during the period 2004-05 to 2008-09, the actual deficit, including off-budget liabilities often exceeded the targets set by the FRBM Act as well as those outlined in the 12th Finance Commission. In fact, in 2008-09, official fiscal deficit at 6 percent of GDP was double the target set under the FRBM Act. Inclusion of off budget liabilities such as oil and fertilizer bonds amounted to an additional 2.2 percent of GDP in 2008-09.

Part of the deterioration in fiscal deficit can be attributed to various fiscal stimulus measures to support growth in the aftermath of Global Financial Crisis. However, Simone and Topalova (2009) estimate these measures to account for only 0.6 percent of GDP. Even in the absence of these stimulus measures the fiscal deficit would have deteriorated considerably with the introduction of schemes such as agriculture loan waiver, expansion of National Rural Employment Guarantee Scheme and implementation of Sixth Pay Commission recommendations, which hiked government employees' salaries significantly. The surge in global commodity prices, and absence of expenditure reforms resulted in subsidies' bill ballooning dramatically. These measures have resulted in the actual fiscal deficit breaching the target set by the 13th Finance Commission in recent years with the goal of achieving a fiscal deficit of 3 percent of GDP proving elusive.

Below we estimate the impact of fiscal dominance on inflation following the vector auto regression (VAR) model outlined in Raj et al (2011). We employ a 4 variable VAR model with the variables being change in gross fiscal deficit as a percentage of GDP, inflation rate measured as the change in Wholesale Price Index and the policy rate. The policy rate is proxied by weighted

money market rate as it embraces the repo or reverse repo rate depending on the prevailing liquidity conditions. The final variable is the output gap, which is considered as a proxy for unemployment rate, as time series data on the latter is not available.

Table 8: Test for Unit Root

	Augmented Dickey-Fuller		Phillip Perron	
	Level	First Difference	Level	First Difference
Fiscal Deficit	-10.164***	-12.593***	-16.204***	-28.083***
Output Gap	-4.342***	-8.312***	-4.373**	-8.505***
Inflation Rate	-2.640*	-4.550**	-3.027**	-4.424**
Policy Rate	-2.474	-7.229***	-2.459	-7.277***

***, ** and * indicate significance at 1%, 5% and 10% levels.

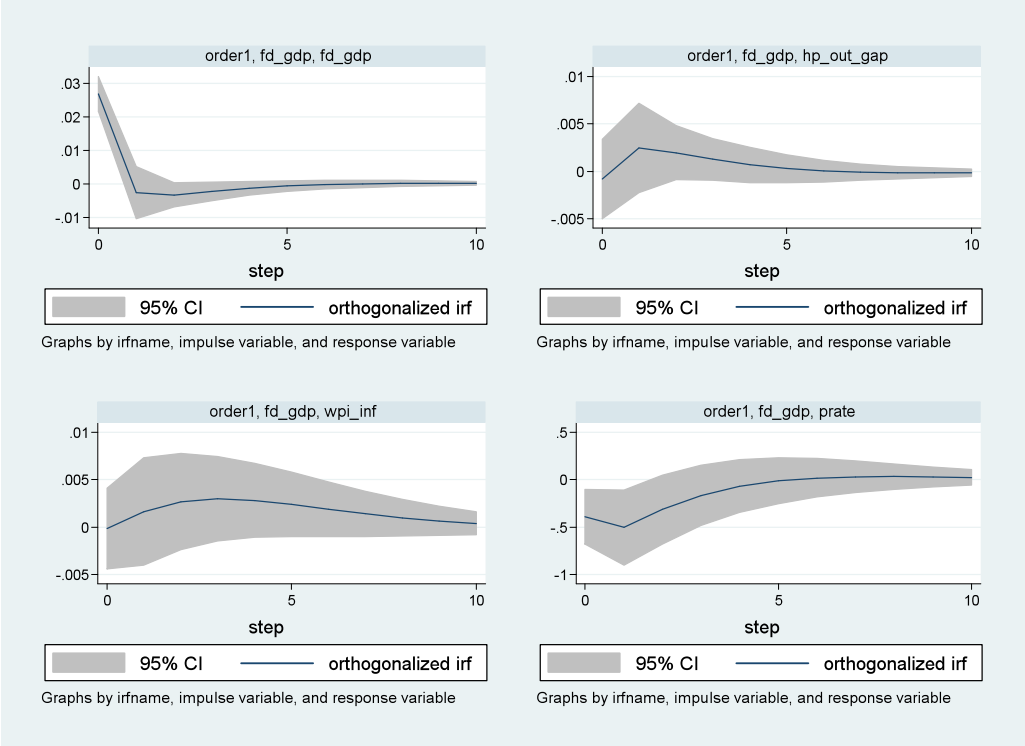
Source: Database on Indian Economy and Authors' Calculation

Prior to conducting the VAR analysis we examine the stationarity properties of the key variables using the standard Augmented Dicky Fuller and Phillip-Perron tests. The results are highlighted in Table (8). Apart from the policy rate variable, all other variables are stationary in levels, while all variables are stationary in first difference.

The optimal lag length of the VAR is selected as one based on various lag length selection criteria and the ordering of the variables are based on the Granger causality tests. We find that policy rate being influenced by other variables while fiscal deficit being least influenced. Figure 9 highlights the impulse response functions as a result of a fiscal deficit shock.

A unit positive shock to fiscal deficit immediately increases it and then converges to its long term equilibrium level after about five quarters. The fiscal stimulus raises the aggregate demand and has a positive impact on output gap in the next period, and the impact slowly dies down over the next seven quarters. The impact of the fiscal stimulus to output is evident only in the short run and could be attributed to the crowding out of private sector investment. An increase in output gap or an increase in output over its potential leads to a rise in inflation, which takes more than two years to subside. Finally, we find that monetary policy reacts with a lag and in a cyclical manner.

Figure 9: Impulse Response Function of a Fiscal Deficit Shock



Source: Database on Indian Economy and Authors' Calculation

The forecast error-variance decomposition shows that shocks to fiscal deficit are important in explaining the volatility of inflation. These shocks explain about 18 percent of the variation in inflation after three quarters. Thus it is evident that expansionary fiscal policy by stimulating aggregate demand leads to a rise in price level in India. Hence, any success of the monetary policy in containing inflation would be crucially contingent on appropriate fiscal policy.

The UPCR recommends reduction of the central government's fiscal deficit to 3 percent of GDP by 2016-17. However, a couple of factors make achieving this target a challenging task. First, the recently introduced National Food Security Act (2013), aiming to provide subsidized foodgrains to nearly two-third of the population will entail significant fiscal cost. Gulati et al (2013) estimate the cost of this Act to be around Rs. 6821 billion over the next three years or an annual average of 1.8 percent of GDP, assuming a nominal GDP growth of 13 percent. Second, additional fiscal pressures will also arise from the implementation of the recommendations Seventh Pay Commission, which will revise the salaries of the public sector employees. The implementation of the recommendations of the Sixth Pay Commission cost the exchequer around 0.7 percent of GDP in 2008-09.

5. Conclusion

In this paper we evaluate India's readiness to move towards an inflation targeting regime. An estimation of the Taylor Rule for India shows that historically the RBI has put higher emphasis on inflation rate compared to output gap and exchange rate. This along with RBI gaining greater monetary independence and allowing more exchange rate flexibility in recent years, places the central bank in a reasonably good position to initiate a move toward inflation targeting regime. However, a natural corollary of such a move would be the RBI not stemming volatile movements of the exchange rate and not being able to shore up reserves. Thus the benefits of lower inflation need to be balanced with the economic costs associated with exchange rate volatility and low level of reserves. Other concerns include the efficacy of using CPI inflation as the nominal anchor given that CPI inflation is much more sensitive to supply side pressures including agriculture output and fuel prices compared to demand side pressures, and monetary policy has limited bearing on the supply side drivers. This concern could get accentuated with a conservative choice of inflation target and band, relative to the structure of the Indian economy, achieving which might result in significant deflationary cost. Finally, high level of fiscal deficit continues to remain a strong bottleneck to the success of inflation targeting regime both by stimulating inflation and impeding monetary transmission.

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